Claims

[c1] What is claimed is:

1. A magnetic core, comprising:

at least a first layer of material having a relatively high magnetic permeability;

at least a second layer of material having a relatively low magnetic permeability abutting said first layer of material; and

wherein said first and second layers of material have a profile with at least one opening therethrough for accepting a current carrying conductor.

[c2] 2. The magnetic core of claim 1, wherein;

said first and second layers of material are selected from the group consisting of a NiFe alloy having greater than about 50% Ni, a NiFe alloy having about 80% Ni, a Co-based amorphous metallic alloy, a CoFe alloy, a CoFe-V alloy, a NiFe alloy having no greater than about 50% Ni, a NiFe alloy having about 50% Ni, an Fe-base amorphous metallic alloy, and a SiFe alloy.

[c3] 3. The magnetic core of claim 1, wherein;

said first layer of material has about 10% more Ni than said second layer of material.

[c4] 4. The magnetic core of claim 1, wherein;

said first layer of material has about 20% more Ni than said second layer of material.

[c5] 5. The magnetic core of claim 1, wherein;

said first layer of material has about 30% more Ni than said second layer of material.

[c6] 6. The magnetic core of claim 1, wherein;

said profile is selected from the group consisting of substantially O shaped, substantially C shaped and substantially figure-eight shaped.

[c7] 7. The magnetic core of claim 1, wherein;

said first and second layers of material have a width, a thickness and a length; and

wherein said first and second layers of material are stacked in face-to-face relationship with one another.

[c8] 8. The magnetic core of claim 1, wherein;

said first and second layers of material have a width and a thickness, and an assembly-defined length; and

wherein said first and said second layers of material are concentrically arranged in face-to-face relationship with one another.

[c9] 9. A current sensor, comprising:

a magnetic core having at least a first layer of material having a relatively high magnetic permeability and at least a second layer of material having a relatively low magnetic permeability abutting said first layer of material;

wherein said core has a profile with at least one opening therethrough for accepting a current carrying conductor;

wherein said profile is selected from the group consisting of substantially O shaped, substantially C shaped and substantially figure-eight shaped; and

a signal generator that provides an output signal representative of the magnetic flux associated with said current carrying conductor.

[c10] 10. The current sensor of claim 9, wherein:

said profile is substantially O shaped with at least one leg;herehere

wherein said signal generator is at least one secondary winding arranged about said leg; and

wherein said secondary winding comprises a bobbin having first and second bobbin ends and wire turns arranged on said bobbin.

[c11] 11. The current sensor of claim 9, wherein:

said profile is substantially C shaped;

wherein said core comprises spaced opposed gap faces to define an air gap therebetween; and

wherein said signal generator is a magnetic flux sensor arranged within said air gap.

[c12] 12. The current sensor of claim 9, wherein:

said profile is substantially figure-eight shaped;

wherein said core comprises spaced opposed gap faces in the central leg of said figure-eight shape to define an air gap therebetween; and

wherein said signal generator is a magnetic flux sensor arranged within said air gap.

[c13] 13. The current sensor of claim 9, wherein;

said first and second layers of material are selected from the group consisting of a NiFe alloy having greater than about 50% Ni, a NiFe alloy having about 80% Ni, a Co-based amorphous metallic alloy, a CoFe alloy, a CoFe-V alloy, a NiFe alloy having no greater than about 50% Ni, a NiFe alloy having about 50% Ni, an Fe-base amorphous metallic alloy, and a SiFe alloy.

[c14] 14. The current sensor of claim 9, wherein;

said first layer of material has about 10% more Ni than said second layer of material.

[c15] 15. The current sensor of claim 9, wherein;

said first layer of material has about 20% more Ni than said second layer of material.

[c16] 16. The current sensor of claim 9, wherein;

said first layer of material has about 30% more Ni than said second layer of material.

[c17] 17. A current transformer, comprising:

a magnetic core having at least a first layer of material having a relatively high magnetic permeability and at least a second layer of material having a relatively low magnetic permeability abutting said first layer of material;

wherein said core has a profile with at least one opening therethrough for

accepting a current carrying conductor;

wherein said profile is selected from the group consisting of substantially O shaped, substantially C shaped and substantially figure-eight shaped;

wherein said core has at least one leg and at least one secondary winding arranged thereabout;

wherein said secondary winding comprises a bobbin having first and second bobbin ends and wire turns arranged on said bobbin;

wherein said secondary winding provides output power; and

a signal generator that provides an output signal representative of the magnetic flux associated with said current carrying conductor.

[c18] 18. The current transformer of claim 17, wherein:

said profile is substantially C shaped;

wherein said core comprises spaced opposed gap faces to define an air gap therebetween; and

wherein said signal generator is a magnetic flux sensor arranged within said air gap.

[c19] 19. The current transformer of claim 17, wherein:

said profile is substantially figure-eight shaped;

wherein said core comprises spaced opposed gap faces in the central leg of said figure-eight shape to define an air gap therebetween; and

wherein said signal generator is a magnetic flux sensor arranged within said air gap.

[c20] 20. The current transformer of claim 17, wherein;

said first and second layers of material are selected from the group consisting of a NiFe alloy having greater than about 50% Ni, a NiFe alloy having about 80% Ni, a Co-based amorphous metallic alloy, a CoFe alloy, a CoFe-V alloy, a NiFe alloy having no greater than about 50% Ni, a NiFe alloy having about 50% Ni, an Fe-base amorphous metallic alloy, and a SiFe alloy.

[c21] 21. The current transformer of claim 17, wherein;

said first layer of material has about 10% more Ni than said second layer of material.

[c22] 22. The current transformer of claim 17, wherein;

said first layer of material has about 20% more Ni than said second layer of material.

[c23] 23. The current transformer of claim 17, wherein;

said first layer of material has about 30% more Ni than said second layer of material.

[c24] 24. A circuit breaker, comprising:

a circuit breaker housing having a base and a cover arranged thereon;

at least one pair of separable contacts within said housing;

a current sensor strap coupled to said contacts;

an operating mechanism within said housing for operating said contacts;

an electronic trip unit within said housing coupled to said sensor strap and said mechanism; and

a current transformer comprising;

a magnetic core having at least a first layer of material having a relatively high magnetic permeability and at least a second layer of material having a relatively low magnetic permeability abutting said first layer of material;

wherein said core has a profile with at least one opening therethrough for accepting said sensor strap;

wherein said profile is selected from the group consisting of substantially O shaped, substantially C shaped and substantially figure-eight shaped;

wherein said core has at least one leg and at least one secondary winding arranged thereabout;

wherein said secondary winding comprises a bobbin having first and second bobbin ends and wire turns arranged on said bobbin;

wherein said secondary winding provides output power; and

a signal generator that provides an output signal representative of the magnetic flux associated with said sensor strap.

[c25] 25. The circuit breaker of claim 24, wherein;

said profile is substantially C shaped;

wherein said core comprises spaced opposed gap faces to define an air gap therebetween; and

wherein said signal generator is a magnetic flux sensor arranged within said air gap.

[c26] 26. The circuit breaker of claim 24, wherein;

said profile is substantially figure-eight shaped;

wherein said core comprises spaced opposed gap faces in the central leg of said figure-eight shape to define an air gap therebetween; and

wherein said signal generator is a magnetic flux sensor arranged within said air gap.

[c27] 27. The circuit breaker of claim 24, wherein;

said first and second layers of material are selected from the group consisting of a NiFe alloy having greater than about 50% Ni, a NiFe alloy having about 80% Ni, a Co-based amorphous metallic alloy, a CoFe alloy, a CoFe-V alloy, a NiFe alloy having no greater than about 50% Ni, a NiFe alloy having about 50% Ni, an Fe-base amorphous metallic alloy, and a SiFe alloy.

[c28] 28. The circuit breaker of claim 24, wherein;

said first layer of material has about 10% more Ni than said second layer of material.

[c29] 29. The circuit breaker of claim 24, wherein;

said first layer of material has about 20% more Ni than said second layer of material.

[c30] 30. The circuit breaker of claim 24, wherein;

said first layer of material has about 30% more Ni than said second layer of material.

[c31] 31. A method of assembling a magnetic core, comprising the steps of;

selecting at least a first lamination comprising a material having a relatively high magnetic permeability and a width, a thickness and a length;

selecting at least a second lamination comprising a material having a relatively low magnetic permeability and a width, a thickness and a length;

stacking said first and second laminations in juxtaposed relationship with respect to each other; and

coupling said first and second laminations with respect to each other.

[c32] 32. The method of assembling a mixed material magnetic core of claim 31 further comprising the steps of;

selecting said first and second laminations from the group consisting of a NiFe alloy having greater than about 50% Ni, a NiFe alloy having about 80% Ni, a Co-based amorphous metallic alloy, a CoFe alloy, a CoFe-V alloy, a NiFe alloy having no greater than about 50% Ni, a NiFe alloy having about 50% Ni, an Fe-base amorphous metallic alloy, and a SiFe alloy.

[c33] 33. The method of assembling a mixed material magnetic core of claim 31 further comprising the steps of;

selecting said first lamination from a material having about 10% more Ni than said second lamination.

[c34] 34. The method of assembling a mixed material magnetic core of claim 31 further comprising the steps of;

selecting said first lamination from a material having about 20% more Ni than said second lamination.

[c35] 35. The method of assembling a mixed material magnetic core of claim 31 further comprising the steps of;

selecting said first lamination from a material having about 30% more Ni than said second lamination.

[c36] 36. A method of assembling a mixed material magnetic core comprising the steps of;

selecting at least a first lamination comprising a material having a relatively high magnetic permeability and a width and a thickness;

selecting at least a second lamination comprising a material having a relatively low magnetic permeability and a width and a thickness;

coiling said first and second laminations in juxtaposed relationship with respect to each other between a start and a stop position; and

coupling said first and second laminations with respect to each other.

[c37] 37. The method of assembling a mixed material magnetic core of claim 36 further comprising the steps of;

selecting said first and second laminations from the group consisting of a NiFe alloy having greater than about 50% Ni, a NiFe alloy having about 80% Ni, a Co-based amorphous metallic alloy, a CoFe alloy, a CoFe-V alloy, a NiFe alloy having no greater than about 50% Ni, a NiFe alloy having about 50% Ni, an Fe-base amorphous metallic alloy, and a SiFe alloy.

[c38] 38. The method of assembling a mixed material magnetic core of claim 36 further comprising the steps of;

selecting said first lamination from a material having about 10% more Ni than said second lamination.

[c39] 39. The method of assembling a mixed material magnetic core of claim 36 further comprising the steps of;

selecting said first lamination from a material having about 20% more Ni than said second lamination.

[c40] 40. The method of assembling a mixed material magnetic core of claim 36 further comprising the steps of;

selecting said first lamination from a material having about 30% more Ni than said second lamination.

[c41] 41.A magnetic core, comprising:

a means for concentrating a magnetic flux associated with a current carrying conductor;

wherein said means for concentrating a magnetic flux yields a magnetic flux that is representative of the rms current level of the associated current with an accuracy from about 98.7% to about 100% when the associated current is at about 0.2X;

wherein said means for concentrating a magnetic flux yields a magnetic flux that is representative of the rms current level of the associated current with an accuracy from about 99.7% to about 100% when the associated current is at about 1X;

wherein said means for concentrating a magnetic flux yields a magnetic flux that is representative of the rms current level of the associated current with an accuracy greater than about 94% when the associated current is at about 9X; and

wherein said means for concentrating a magnetic flux yields a magnetic flux that is representative of the peak current level of the associated current with an accuracy from about 90% to about 100% when the associated current is at about 1000X.